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Abstract – Dritev 2019

The driveline architecture and 2-speed transmission of Rimac C_Two

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The Rimac Automobili C_Two is developed to showcase what electric vehicles can do – that it is already today possible to outperform combustion engined cars in almost every category. Some of the goals were to achieve a 0-100 km/h time below 2 seconds, top speed above 400 km/h, range of over 600 km while still having a usable and comfortable car the owners will really want and enjoy to use. The C_Two is not just about numbers – a goal was also to achieve outstanding track performance and handling. One of the ways to achieve that is through a precise and advanced torque vectoring system that acts through 4 electric motors, each controlling one wheel separately. In order to achieve those targets, everything was developed from scratch for this vehicle – a carbon-fibre monocoque with integrated 120 kWh high performance battery system, a completely new battery architecture, a new front and rear powertrain, including different architectures for the front and rear axle, even the 48V pumps and fans very developed specifically for this car.

In order to archive an outstanding launch performance the C_Two has two 500 kW/700 Nm motors connected to two independently acting 2-speed transmissions on the rear axle. Together with two smaller 200kW/500 Nm motors connected to single-speed gearboxes at the front axle, that layout allows controlling each wheel separately. Thus, torque vectoring functions are available on all four wheels assuring tremendous yaw dynamics. Each transmission side on rear axle handles input torques up to 700 Nm what results in wheel torques of over 7000 Nm in 1st gear for each rear wheel (in case of enough friction). In 2nd gear the C2 is capable to exceed 400 km/h.

Design requirements for this hypercar have been challenging because of the restricted installation space resulting out of aerodynamics and weight demands. Thus, transmission design has some remarkable innovative features. A planetary gear is used to provide 1st gear's ratio by using the power flow from sun gear to carrier. The ring gear is fixed by a special dog clutch. The huge gear forces excited by the contained linear gear train (one per side) are balance by a steel cage that is retained by the aluminum transmission case. Moreover, axial forces and tilt moments on gears are completely

balances while equally distributing the wheel torques (left/right). Altogether an A-sample for a high performance transmission was designed, assembled and tested.

The presentation gives an overview over Rimac's new hypercar currently developed and its aspired performance. Main parts of the drivetrain are introduced whereas the aspects of the 2-speed transmission will be focused.

Englischer Titel:

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Eigene Vorveröffentlichungen zum Thema: keine

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Stichpunkte (deutsch):

- Aufbau und Leistungseckdaten des elektrischen Antriebs im neuen Rimac-Hypercar „C_Two“
- 2-Gang-Lastschaltgetriebe mit Raddirektantrieb und Torque Vectoring für extreme Performance bezüglich Längs- und Querdynamik

Stichpunkte (englisch):

- Architecture and power data of the electric drive train in the new Rimac hypercar “C_Two”
- 2-speed transmission with direct wheel drive and power shiftability for extreme performance regarding lateral and longitudinal dynamics